



**Carnegie Mellon  
Software Engineering Institute**

Pittsburgh, PA 15213-3890

# Use of CMMI® in Acquisition Environments

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Systems & Software Technology Conference  
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# Agenda

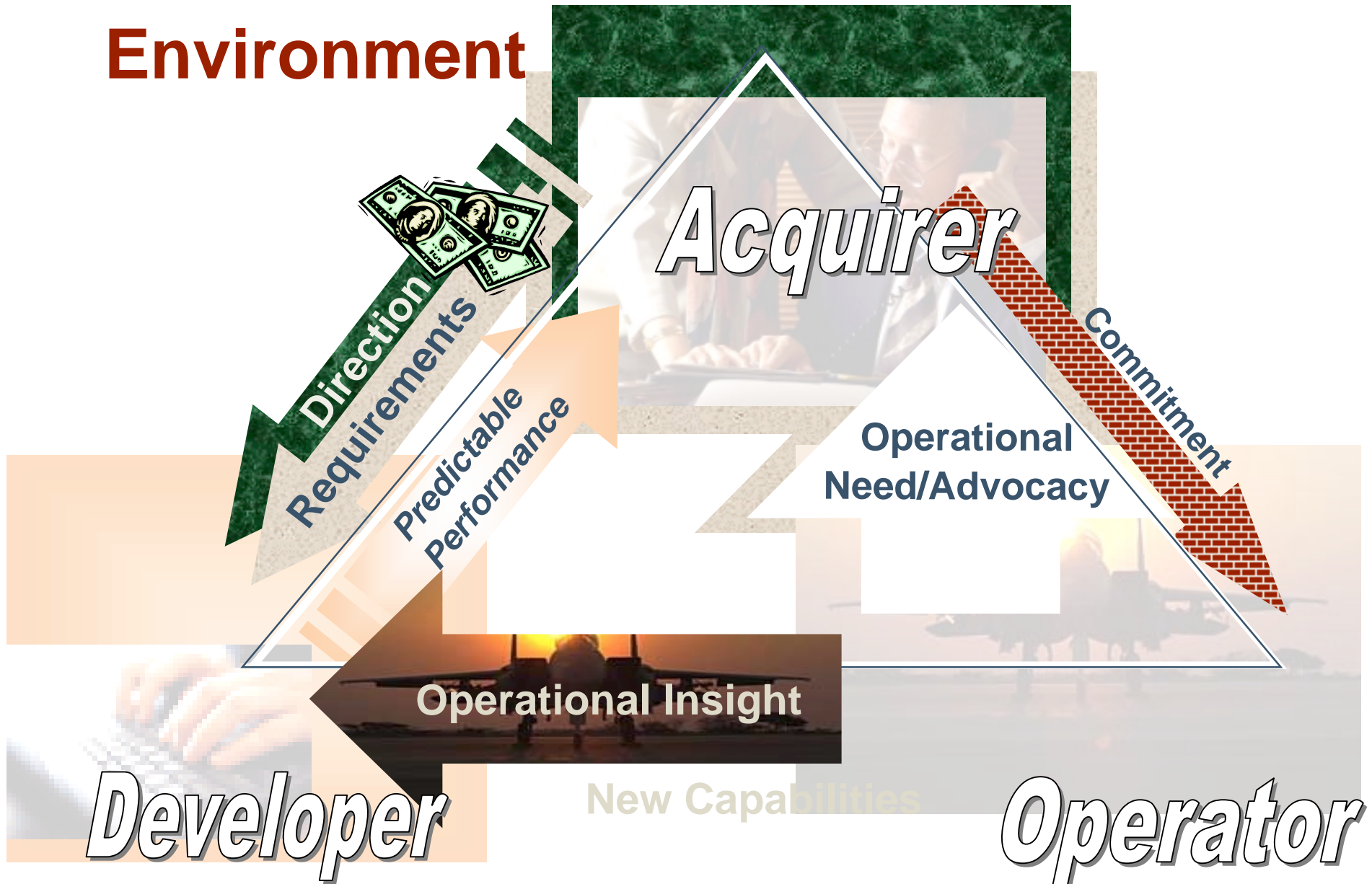
## Introduction

**Using CMMI to Encourage Good Contractor Practices**

**Using CMMI-AM to Improve Acquisition Practices**



# Environment





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**PMO AND PROCESS**

# **Process and the Roles of the PM**

Manage process within the PMO

Manage process applied to the project

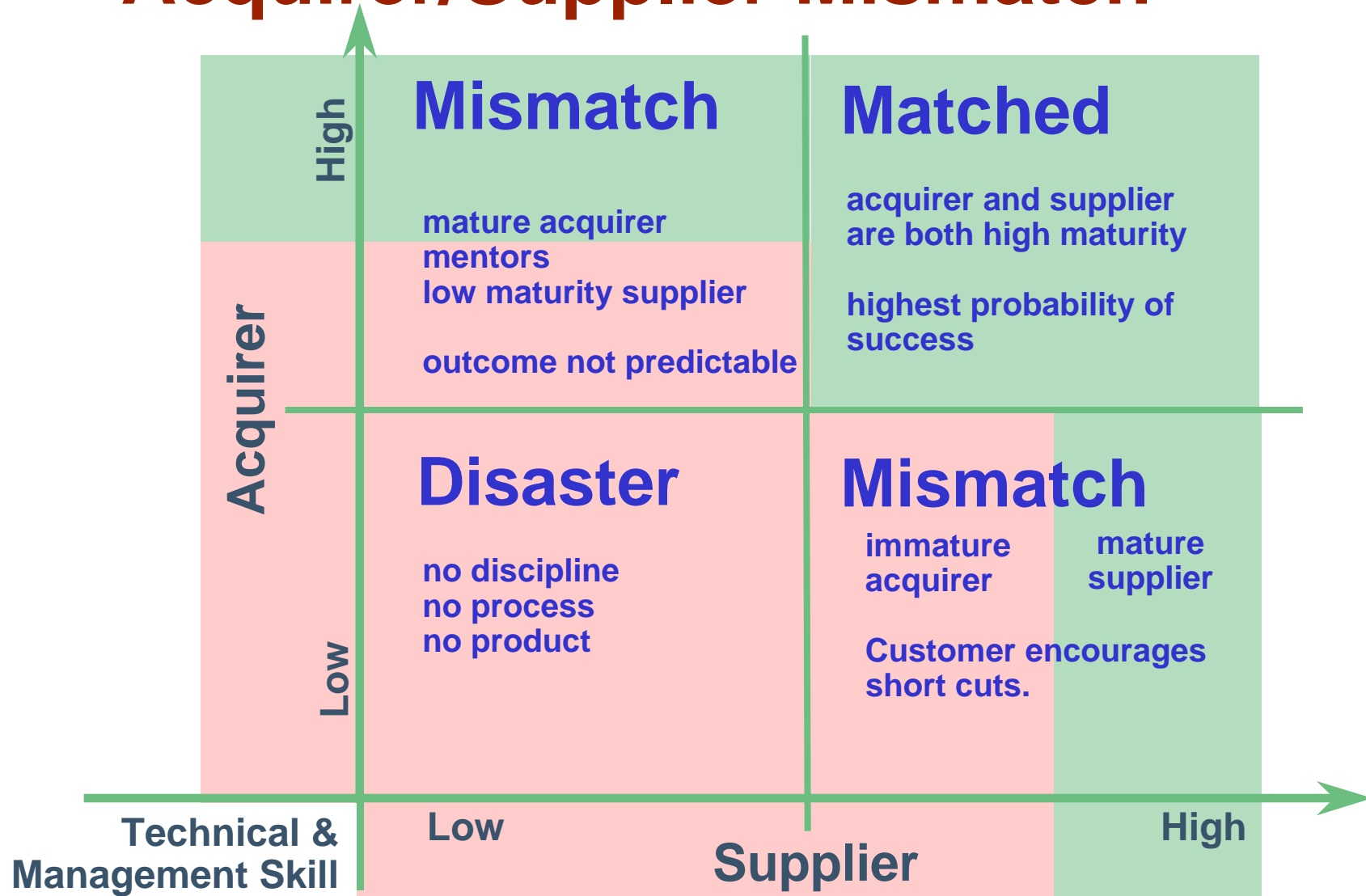
Exercise oversight of the contractors' process management

Ensure integration of contractor and PMO processes





# Acquirer/Supplier Mismatch





# Agenda

Introduction

**Using CMMI to Encourage Good Contractor Practices**

**Using CMMI-AM to Improve Acquisition Practices**



# Problem Statement

Many DoD contractors claim high Maturity Levels (3 and above) as measured by the Capability Maturity Model Integration, yet from the perspective of acquisition program managers on some high visibility *individual programs*, for various reasons, individual teams are not executing to the level claimed in proposals.





## **Example Program**

# **Background**

Large DoD program with multiple, geographically dispersed engineering locations.

Multi-contractor teams (10+) using different processes.

Several million lines of code.

Systems engineering challenges.

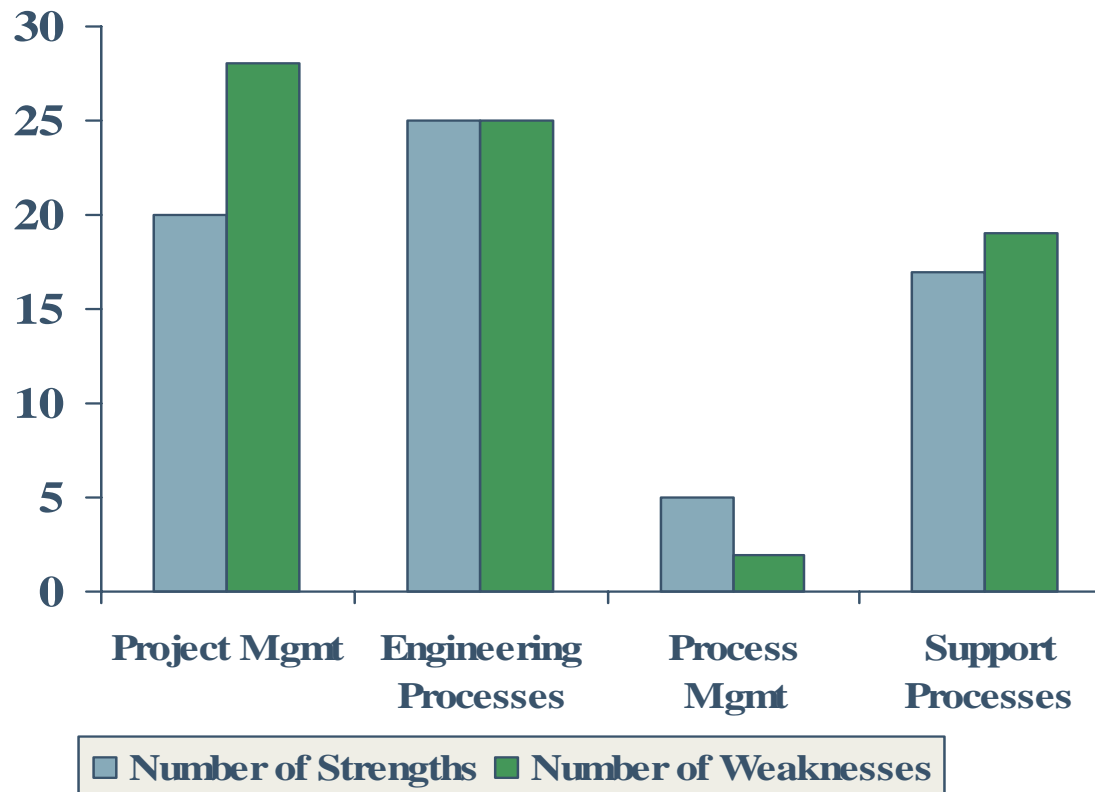
Combination of legacy, re-use, COTS integration and new development.

All contractor sites are Maturity Level 3 or higher.

18 months after contract award, the program office conducted a CMMI “Class B” appraisal on the team.



## Example Program Appraisal Output



### Project Mgmt Processes

- Project Planning
- Project Monitoring & Control
- Integrated Project Mgmt
- Risk Management

### Engineering Processes

- Requirements Mgmt
- Requirements Definition
- Technical Solution
- Product Integration
- Verification (Peer Reviews)

### Process Mgmt

- Organizational Process Focus
- Organizational Process Definition

### Support Processes

- Measurement & Analysis
- Product and Process Quality Assurance
- Configuration Mgmt
- Decision Analysis



## Example Program

# Issues Identified <sup>1</sup>

### PROJECT MANAGEMENT

- Lack of project plans or having only incomplete, conflicting or out of date project plans
- Ineffective use of Integrated Master Schedule as basis for planning/tracking status across program
- Undefined engineering and management processes on program
- Inability to track and manage actions to closure
- Inadequate cost estimation processes, methods, data and tools
- Inadequate staffing and training project personnel
- Tracking dependencies between or across teams not defined
- Managing project data ad hoc
- Inability to proactively identify and manage risks

### ENGINEERING

- Lack of understanding of the program's requirements
- Inability to trace requirements to architecture/design or to test plans/procedures
- Poor linkage of functional and performance requirements
- Inconsistent requirements management at different levels
- No criteria for making architectural/design decisions among alternatives
- Not capturing entire technical data package (requirements, design and design rationale, test results, etc)
- Efficiency of design process/methods in question
- Late definition of integration and test procedures



## Example Program

# Issues Identified <sub>2</sub>

## SUPPORT

Difficult to identify items in configuration management baselines

Lack of ability to manage individual “versions” in incremental development

Inability to effectively managing changes to work products throughout lifecycle

Not conducting audits to establish/ensure integrity of baselines throughout incremental engineering and development

Inefficient change management process (cycle time, volume of changes)

Roles/responsibilities of change control boards not defined

Quality Assurance audits of products and processes not consistent

QA involvement in system and software engineering processes not consistent

No metrics to manage engineering activities (outside of cost/schedule data)



## Example Program

# Results

Early and periodic Class B appraisals using CMMI identified risks to program success

Identified risks were assigned to contractor, to acquirer, or both based upon who was best able to mitigate them.

Many risks were managed jointly and cooperatively between the contractor and the acquirer

Identification of and attention to risks early in the program life cycle led to the ultimate success of the program.



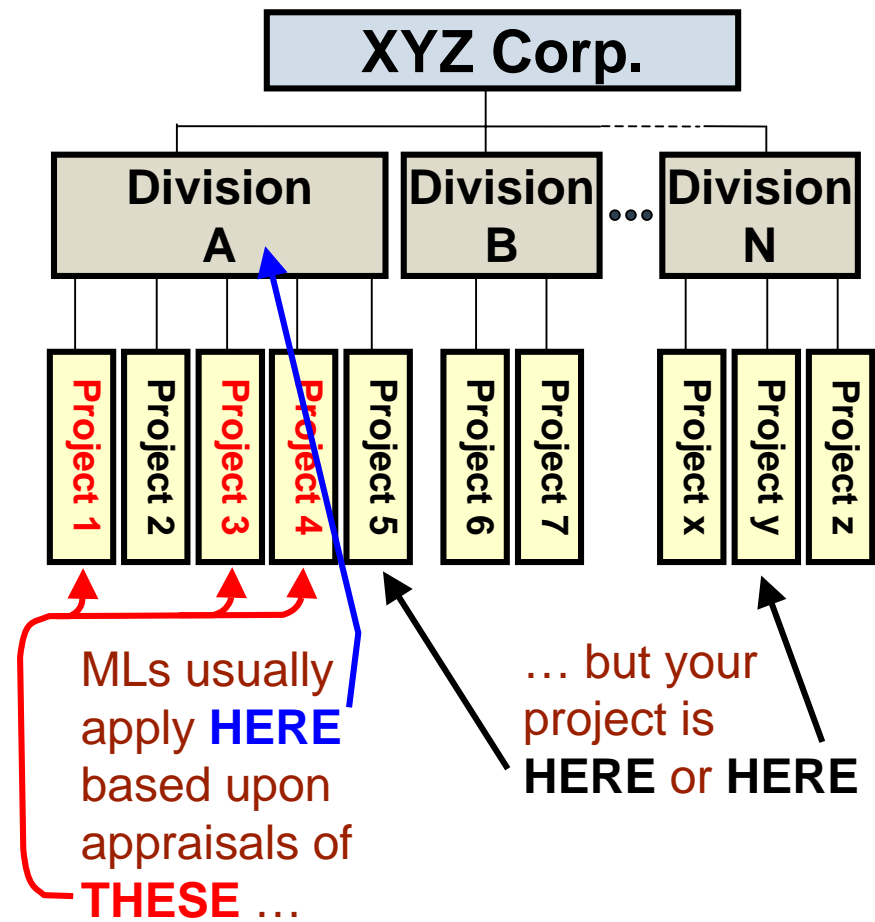
# High Maturity Organizations High Maturity Projects ?

## WHY?

Maturity Levels are good indicators of organizational *potential performance*.

They describe how the next project will *most likely perform* based on a sampling of existing projects.

Maturity Levels reside at the organizational level and are not an indication of how an individual project *is performing*.





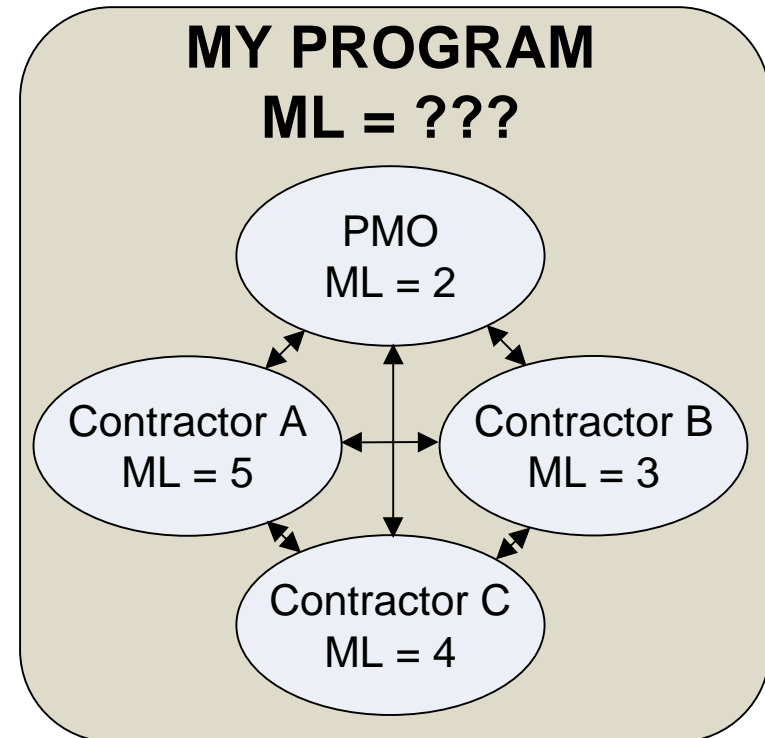
# The Acquirer's Concern

**During  
source  
selection:**

- How capable is a *contractor team* to deliver an operational capability?

**Ongoing:**

- How well is *my program* performing?



Maturity Levels at the organizational level are **necessary but not sufficient** to provide answers to these questions at the program level.



## Key Questions

**Is the appraisal of the contractor's organizational maturity relevant to my project?**

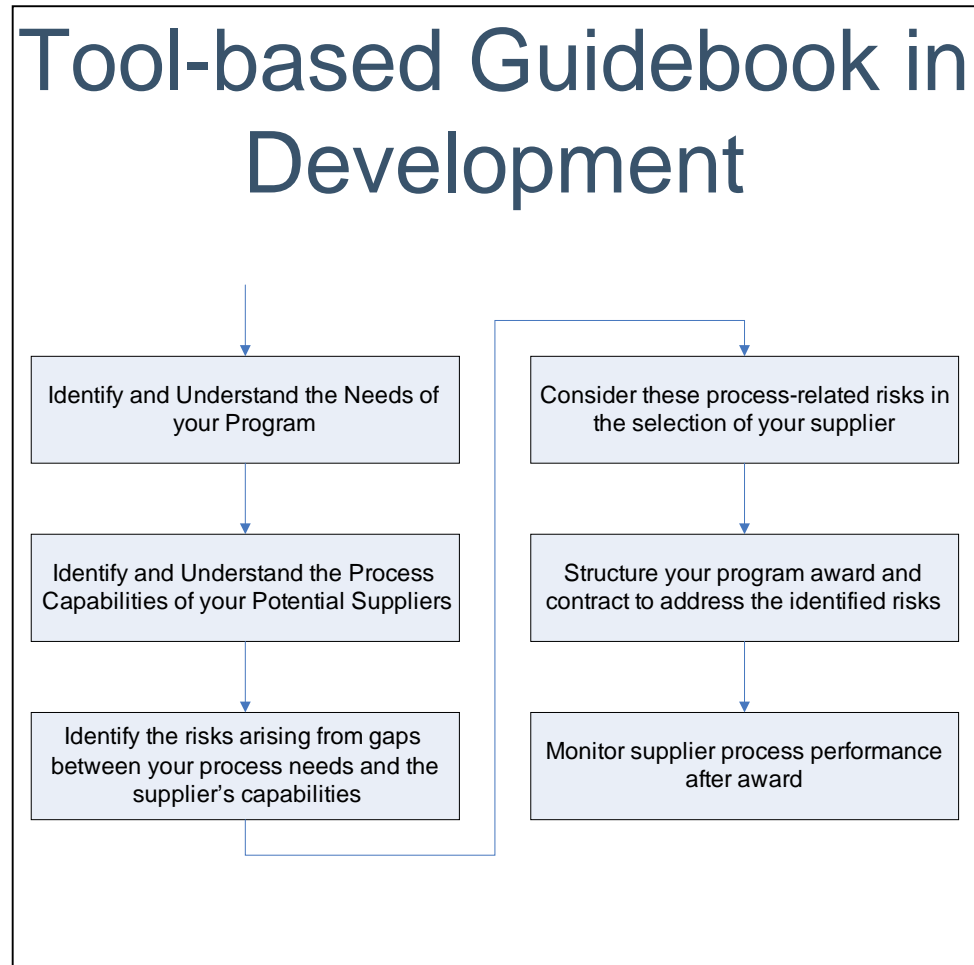
- Did the part of the organization executing my project participate in the appraisal?
- Did projects similar to mine participate in the appraisal?
- Are the appraised processes routinely used by the part of the organization executing my project?
- Are the appraised processes an integral part of the project execution, or are they an overlay on the “the real way the work gets done”?

The **BIG** question: What processes will really be used on **MY** project





# Getting the Processes You Need



**Tools are provided to achieve specific objectives.**

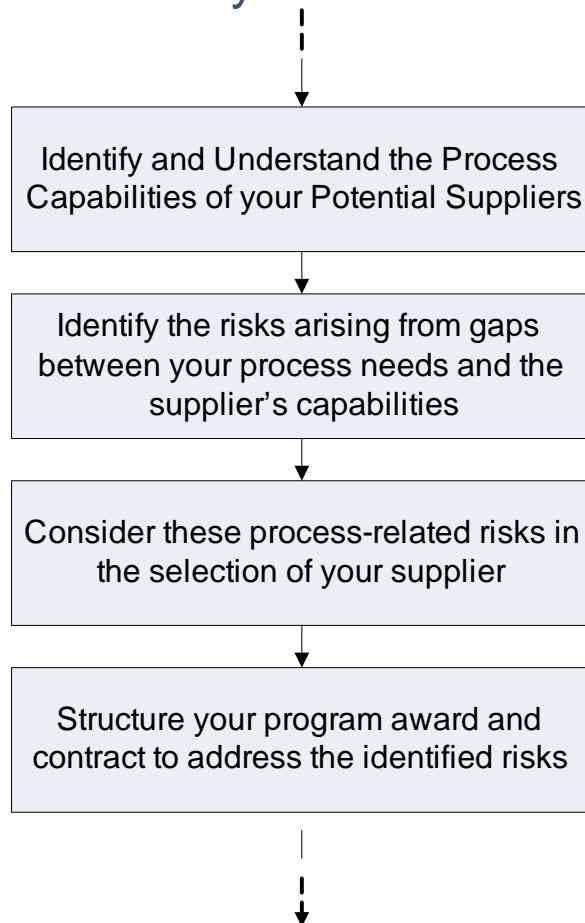
## Tool Overview

- Objective
- How It Works
- When to Use It
- What to Do
- How to Use the Results



# Example from Guidebook

Objective: Identify and understand the process capabilities of my bidders



## **AVAILABLE TOOLS :**

- Request and evaluate recent appraisal data
- Request and evaluate process proposals for your program
- Request and evaluate the approach to integration of prime and subcontractor processes
- Request and evaluate the approach to integration of Prime and PMO processes
- Request and evaluate historical data on process performance
- Perform appraisals



## Development and Review Team

Hal Wilson	(NGC)
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Mike Nicol	(USAF)
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## **Excerpt from Defense Acquisition Guidebook – *Source Selection***

### 4.2.5.2 Capability Reviews

*Capability reviews* ... are a *useful tool* available *during source selections* to assess the offerors' capability in selected critical process areas. Capability reviews may be the appropriate means for evaluating *program-specific critical processes* such as systems engineering, software development, configuration management, etc. ...



## **Excerpt from Defense Acquisition Guidebook – *Contract Monitoring***

### 4.2.5.3 Capability Appraisals

... the program manager retains the right ... to independently *evaluate the process capabilities of the selected team* prior to or immediately after contract award. ... *Periodic appraisals are encouraged as part of contract process monitoring activities.* ... assessments are *most valuable when they apply across the full program team, and not just one segment of the organization* ...



## Summary

Maturity Levels alone do not provide the information an acquirer needs to determine:

- How capable is a *contractor team* to deliver an operational capability?
- How well is *my program* performing?

A team of experts is developing a simple, actionable set of guidelines on how to use the CMMI framework to help reduce program risk.



# Agenda

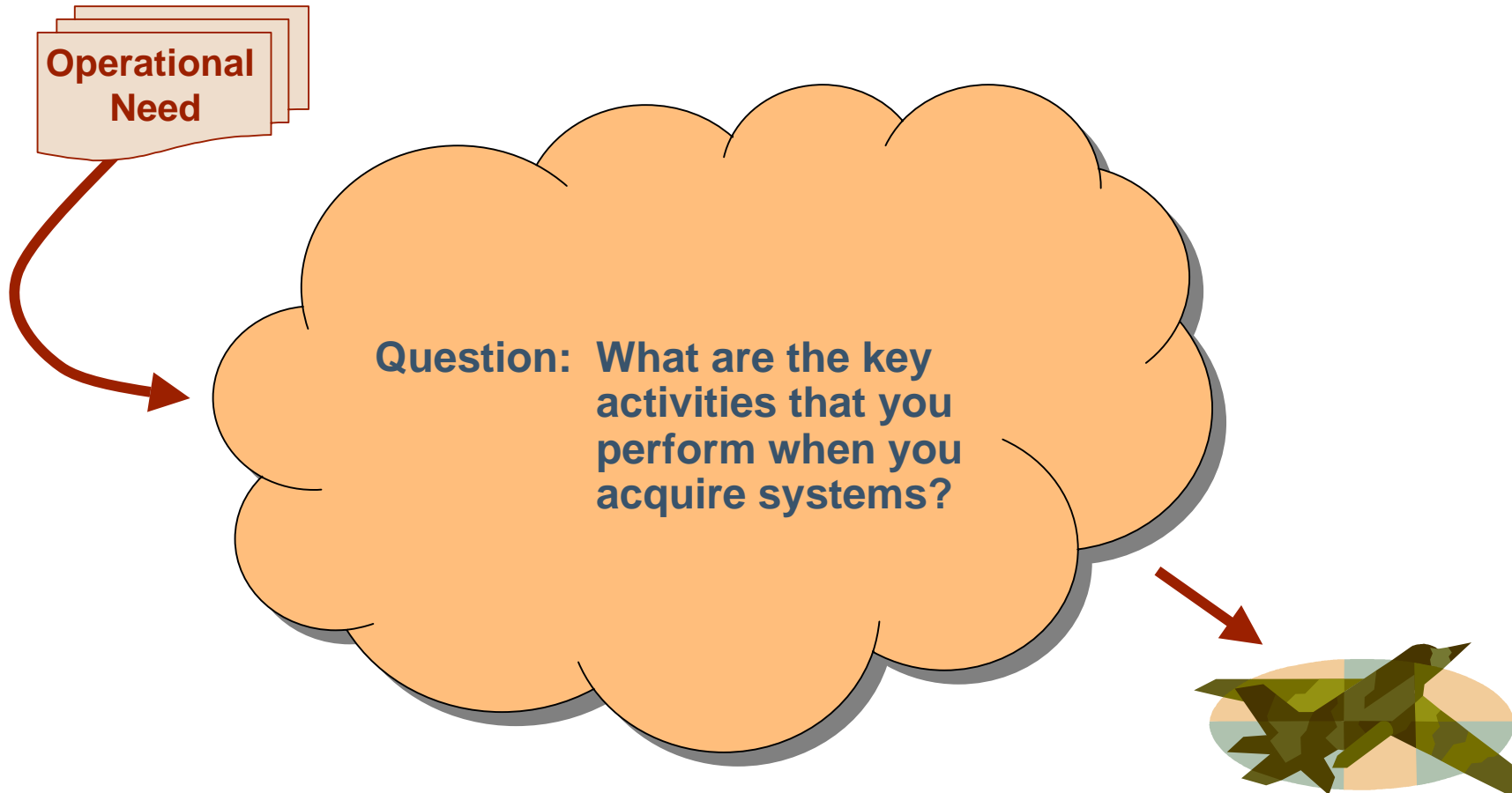
Introduction

Using CMMI to Encourage Good Contractor Practices

Using CMMI-AM to Improve Acquisition Practices



# What is “Acquisition”







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**PMO AND PROCESS**

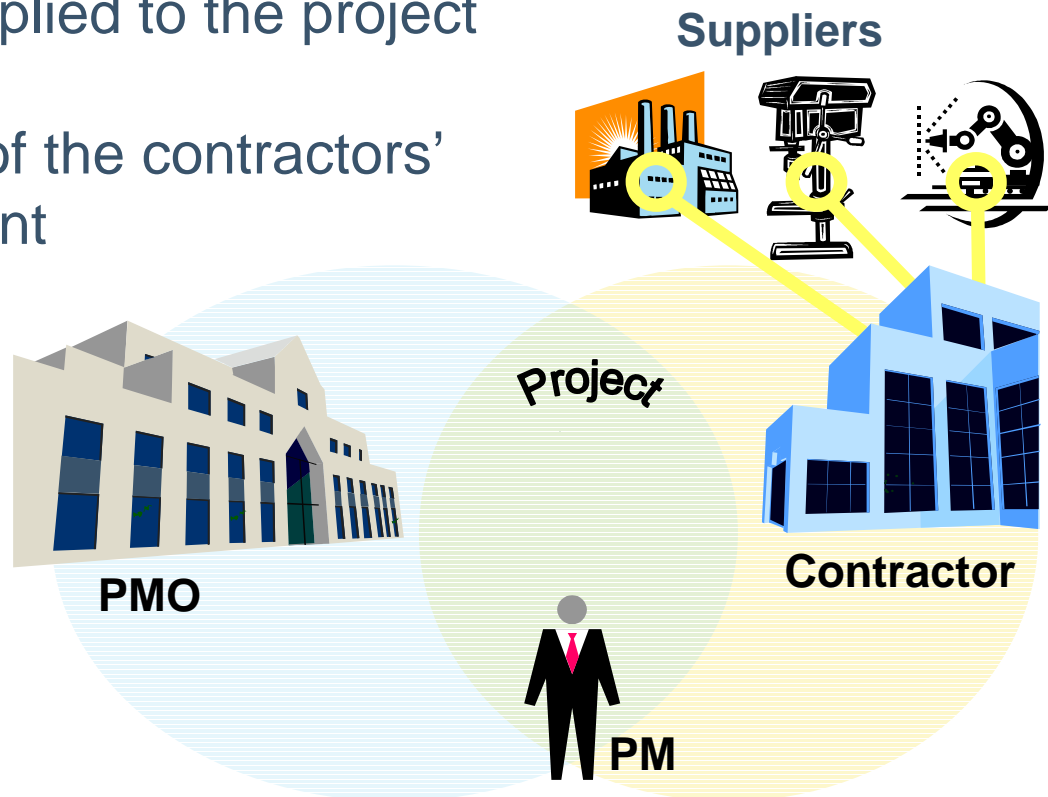
# **Process and the Roles of the PM**

Manage process within the PMO

Manage process applied to the project

Exercise oversight of the contractors' process management

Ensure integration of contractor and PMO processes





# **The PMO Management Role**

**The PM is responsible for managing internal PMO processes. The PM must take a hands-on approach to**

- Identify, define, and document process needs
- Communicate and train the PMO staff
- Support, track, measure, and review the PMO processes





## **PMO AND PROCESS**

# **Program Management Role**

**Define the interface between the PMO and the contractor using the RFP and negotiations**

- Project process requirements
- Project metrics
- Project communication needs
- Project risk management needs

**Manage the interface during contract execution**

- Real-time monitoring of deliverables
- Keep communication channels clear & open
- Develop trust with contractor

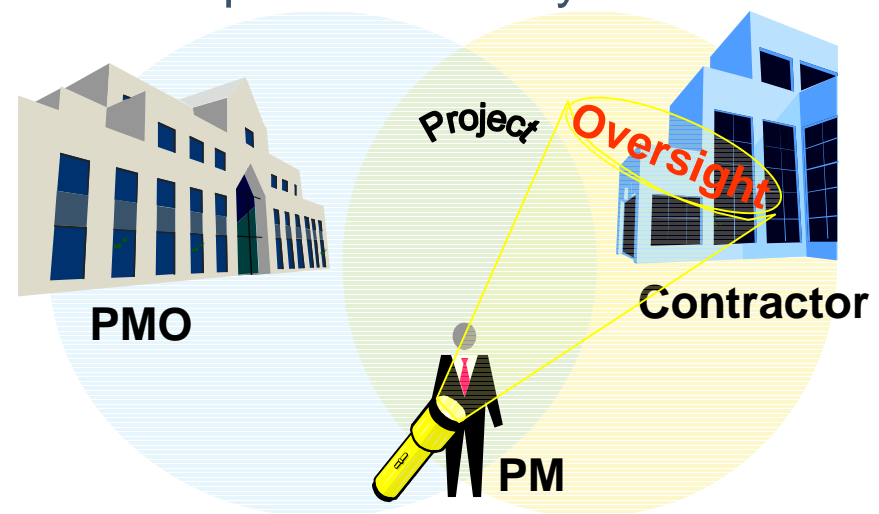




# Contractor Oversight Role <sup>1</sup>

Process maturity of the contractor should be a consideration in source selection

- Obtain process definitions and commitments
  - Just requiring a CMMI Maturity Level is **NOT** enough.
  - You need to ensure that high-maturity processes are applied to YOUR project
  - Require your bidders to define the processes they will use in their proposals
  - Evaluate the proposed processes as a part of source selection
  - Reference the processes in the contract
- Plan process integration

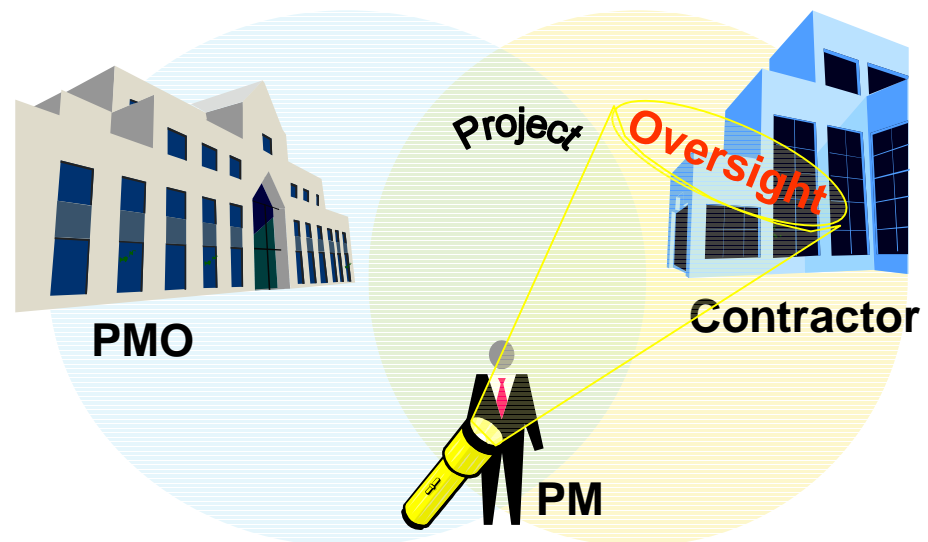




# **Contractor Oversight Role <sub>2</sub>**

**After contract award, ensure that contracted process commitments are kept**

- Committed processes are used by the project team
- Process artifacts are evident
- Process integration is effective and monitored
- Consider periodic independent appraisals of key process areas





# **Subcontractor Oversight Role**

For many systems, the bulk of the work is done by subcontractors

Primary responsibility for oversight of subcontractors lies with the prime contractor

PMO role is to ensure that prime is providing adequate oversight to subcontractors

- Ensure flowdown of project process requirements
- Ensure integration of prime and subcontractor processes



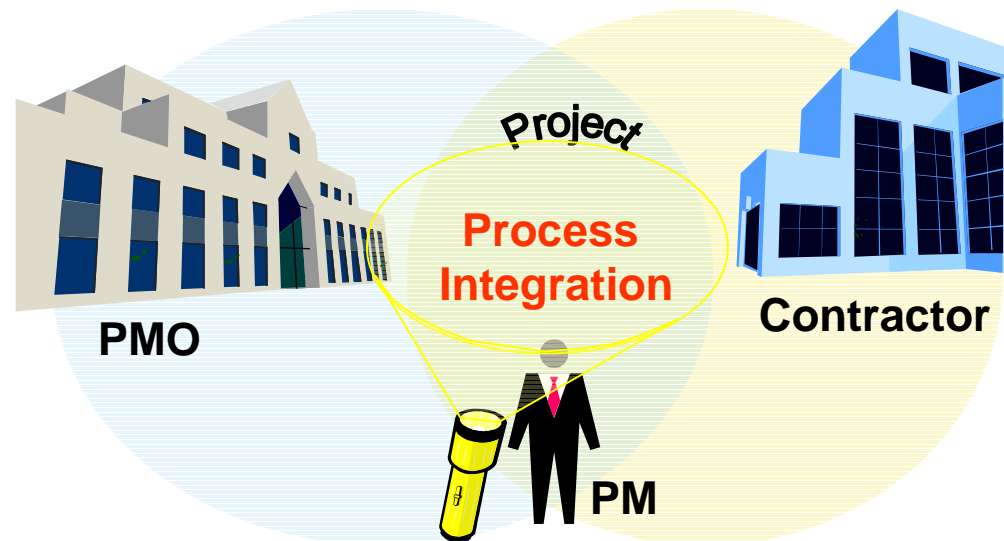


## **PMO AND PROCESS**

# **Process Integration Role**

**It is the PMO's responsibility to ensure PMO and Contractor processes are compatible**

- Include any process “must haves” in the RFP
  - Consider specific compatibility with tools for risk, requirements, schedule, etc.
- Ensure good communications with contractor(s) regarding process incompatibilities
- Integration focus needed throughout project





## **CMMI Acquisition Module (CMMI-AM)**

Focuses on effective acquisition activities and practices that are implemented by first-level acquisition projects (e.g., System Project Office/Program Manager)

Acquisition practices drawn and summarized from existing sources of best practices:

- Software Acquisition Capability Maturity Model (SA-CMM)
- Capability Maturity Model Integration (CMMI)
- FAA Integrated Capability Maturity Model (iCMM)
- Section 804

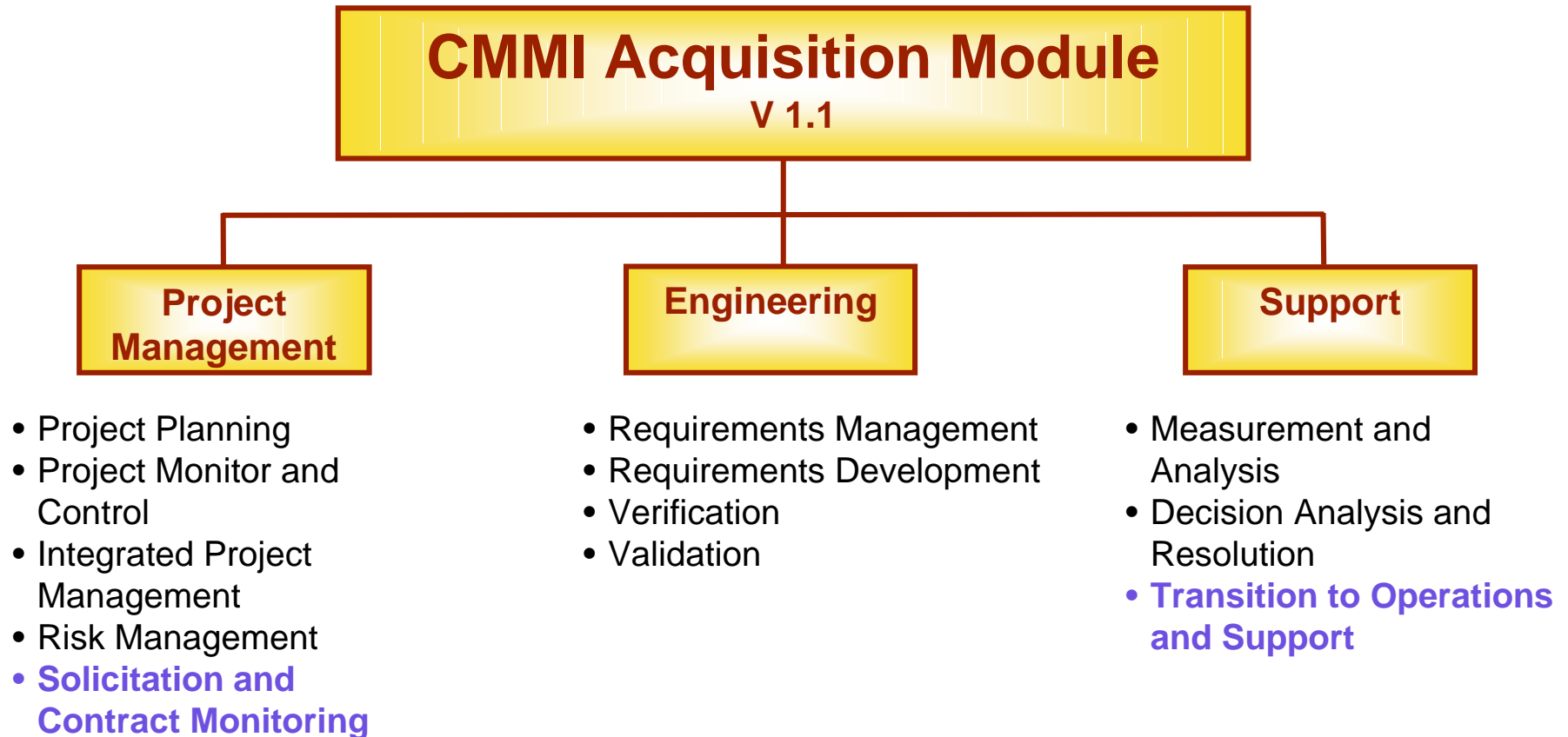
Intended to be used in conjunction with the CMMI as an acquisition “lens” for interpreting the CMMI in acquisition environments

**CMMI-AM – a tool for the acquirer**





# CMMI-AM Structure

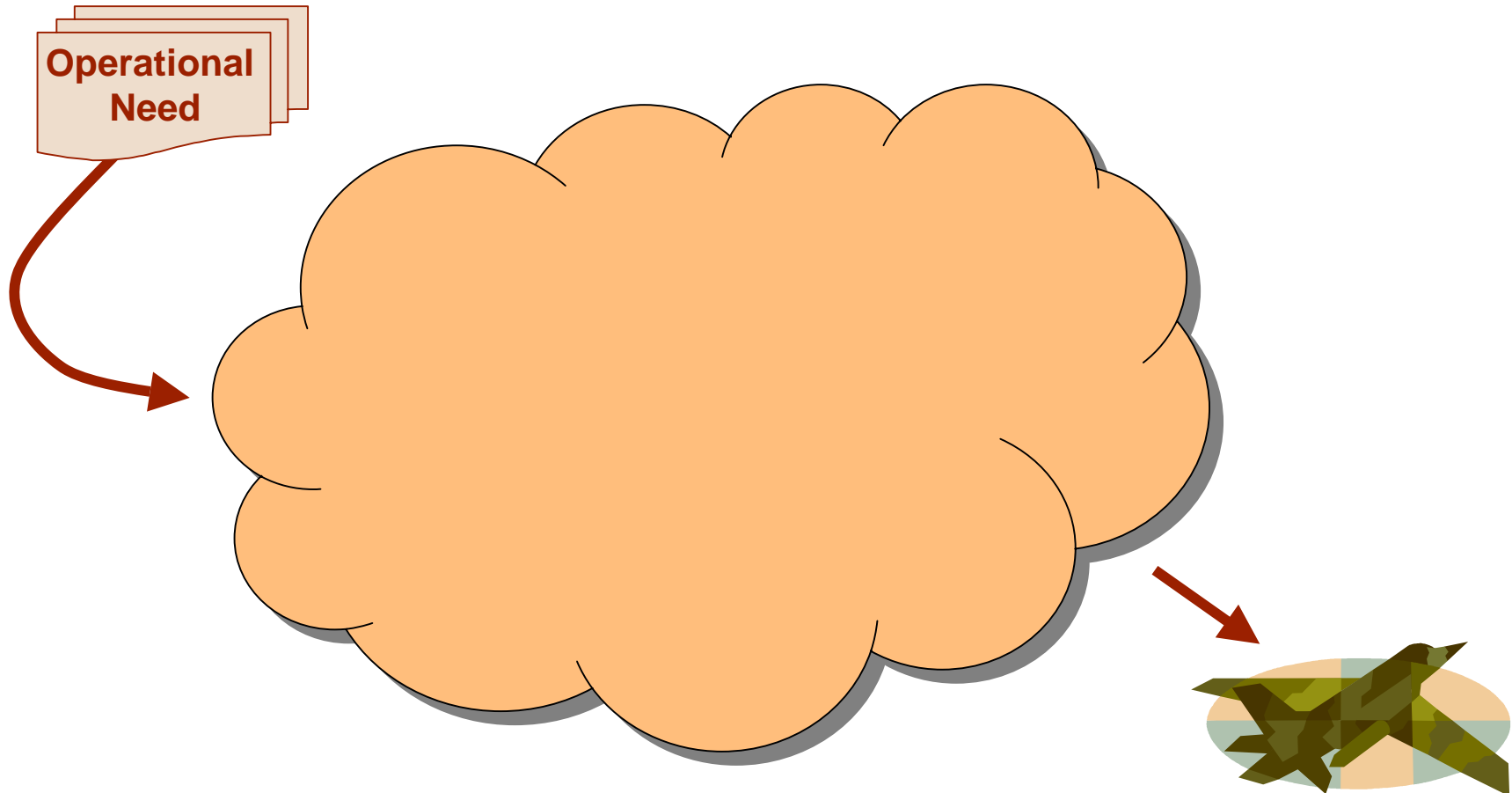


## Key

 **New for CMMI-AM**

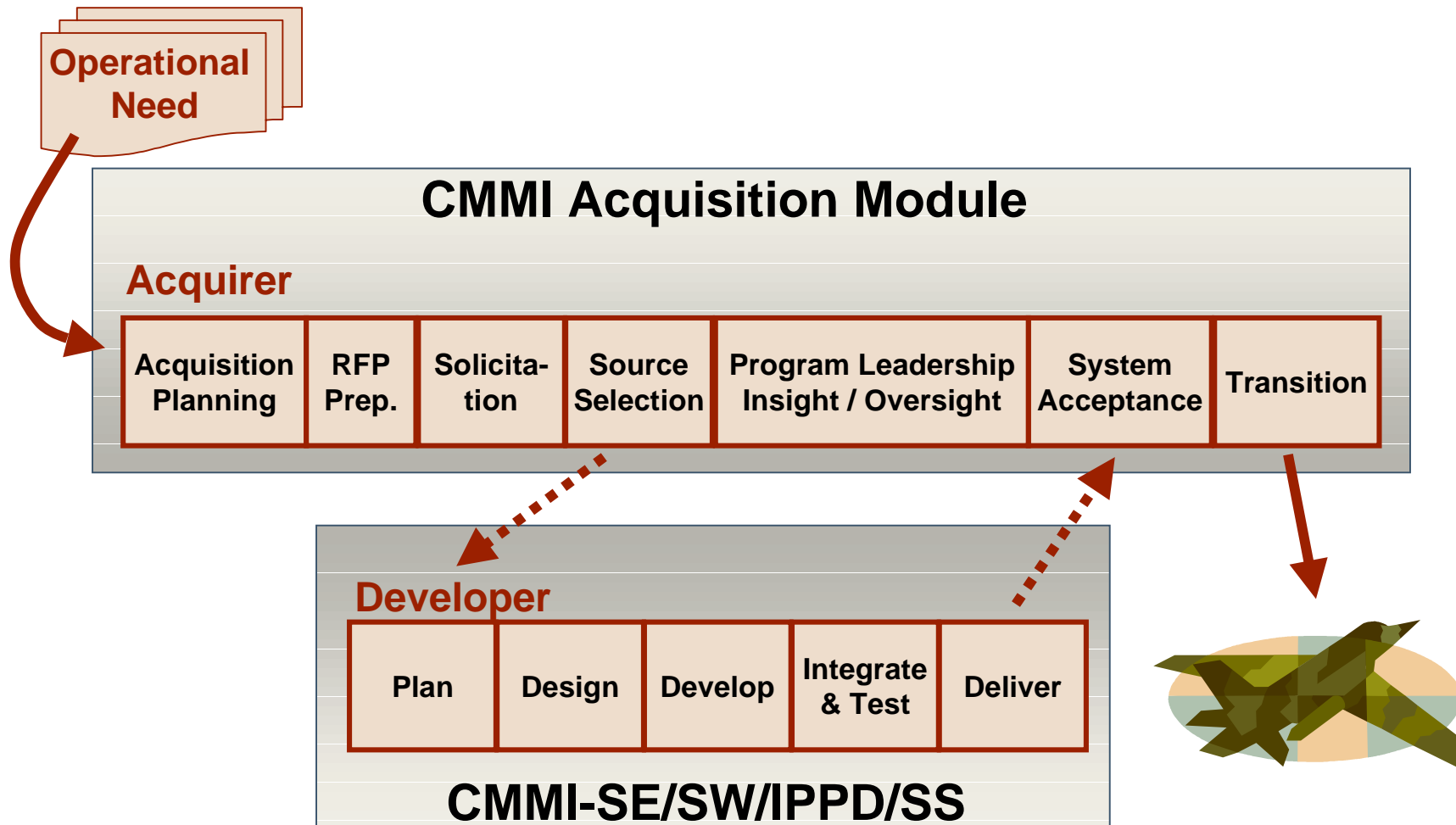


# **“Ad Hoc” Acquisition Practices**





# Explicit Acquisition Practices





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